T M K - P R E M I U M S E R V I C E S
(T M K - P S)

GUIDELINES FOR USE

RE PS 05-003-2015

USE OF
TMK UP PFTHREAD CONNECTION FOR CASINGS WITH GW COMPOUND

Revision 8

2021

Introduction

The present guidelines are worked out taking into account the requirements of the following documents:

- API RP 5C1 Recommended Practice for Care and Use of Casing and Tubing;
- API RP 5B1 Gaging and Inspection of Casing, Tubing and Pipe Line Threads;
- ISO 10405 Petroleum and Natural Gas Industries – Care and Use of Casing and Tubing.
- TR CU 010/2011 – Technical Regulations of EAEC “On the Safety of Machinery and Equipment”.

Information about the guidelines for use

1 APPROVED BY Director of Development

TMK – Premium Services, LLC

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October 13, 2021

2 DEVELOPED BY Serial Design Bureau

3 Revision 8. Effective date is December 14, 2021 with an option of early use.

4 For replacement of Revision 7 introduced into effect in September 28, 2021.

5 The present revision contains amendments and additions as compared to the previous revision and amendments, they are highlighted.

Contents

G U I D E L I N E S S F O R U S E

USE OF TMK UP PF THREAD CONNECTION WITH GW COMPOUND

Effective date 14 -12-2021

1. Scope

The present guidelines contain recommendations for maintenance and use of casing with TMK UP PF thread connection with GW compound under field conditions, including pipe preparation and make-up, string running and pulling operations, as well as guidelines for pipe handling, storage and inspection during operation.

2. Normative references

The present guidelines contain normative references to the following documents:

GOST R ISO 13678-2015 Casing, Tubing, Pipe Line and Elements of Drill Strings for Oil and Gas Industry. Evaluation and testing of thread compounds.

GOST 15150-69 Machines, Instruments and Other Industrial Products. Modifications for Different Climatic Regions. Categories, Operating, Storage and Transportation Conditions as to Environment Climatic Aspects Influence;

API RP 5A3/ISO 13678 Recommended Practice on Thread Compounds for Casing, Tubing and Line Pipe;

RD 39-7-904-83 Instruction on Material, Equipment and Spare Parts Storage in Warehouses on Facilities of Production and Technical Servicing and Completing, Enterprises and Entities of Ministry of Oil Industry;

TU 0254-001-46977243-2002 RUSMA-1, RUSMA-1(3) Thread Compounds;

TU 0254-031-46977243-2004 RUSMA R-4, RUSMA R-4(3) Thread Compounds;

TU 0254-068-46977243-2009 RUSMA R-14, RUSMA R-14 (3) Special Thread Compound;

TU 19.20.29-223-46977243-2018 RUSMA API Modified 1000 Thread Compound;

TU 0254-167-46977243-2015 RUSMA API Modified;

TU 0254-158-46977243-2013 RUSMA Storage Compound.

TU 19.20.29-250-46977243-2018 RUSMA-M3 Thread Compound.

N o t e - The specified document revision shall be applied for dated references taking into account all the issued amendments. The valid revision shall be applied for undated references.

3. Terms and Definitions

For the purposes of the present guidelines the standard terms as well as the following terms and definitions shall be applied:

3.1 **rotation on shoulder:** Preset movement of thread connection in circumferential direction after thread connection surfaces shouldering.

3.2 Design of thread connection, design: Design of thread connection, which takes into account different requirements to passability of internal passage of casing string.

Note - Pipe and coupling with special design of thread connection have unequal inside diameters and inspection of passability is supposed to be carried out with the use of special mandrel correspondingly.

3.3 **box (box connection):** The product with a thread connection on an inside surface.

3.4 **pin (pin connection):** The end of pipe with a thread connection on an outside surface.

3.5 **thread connection (make-up result)**: Make-up of pin and coupling by means of thread.

3.6 **thread connection (structural element)**: Thread, seals, and shoulders machined on pin or coupling, and other auxiliary elements of structure of thread connections;

3.7 **thread seals:** Pin sealing groove and coupling sealing bore ensuring tightness of thread connection upon pin and coupling make-up.

3.8 **thread shoulders:** Pin shoulder and box shoulder acting as an arrester upon pin and coupling make-up.

3.9 **GW:** Green Well compound.

4. Transportation, handling operations and storage

4.1 Transportation

4.1.1 When pipes are transported by sea, railroad (railcars) or trucks, Cargo Shipping Rules and Technical Provisions for Cargo Handling and Fastening applicable to the particular transport type shall be observed.

4.1.2 Pipe transportation, handling and storage shall be carried out with thread protectors screwed on pin and coupling end faces in order to protect thread surface, thread shoulders and thread seals from exposure.

4.1.3 Pipe bundles of different lots and standard sizes can be loaded into same means of transportation, but have to be separated.

4.1.4 Pipe bundles shall be securely fastened during transportation to avoid any movement. Wooden blocks can be used for fastening purposes.

When several pipes bundles are stacked or not bundled pipes are stacked into several ranks, pipe bundles and pipe ranks shall be separated by at least three wooden blocks, with the thickness from 1.3780 to 1.5748 inch each, so that weight of upper pipe ranks is not distributed onto couplings of lower ranks.

4.1.5 When transported by sea, pipe bundles shall not be placed in water inside the vessel's hold or in any other corrosive environment. Dragging of bundles along the piles or hitting bundles against hatches or rails is strictly forbidden.

4.1.6 When loading pipe bundles into railway cars or trucks, wooden girders (blocks) shall be provided for car floors or vehicle beds to ensure required distance between the products and uneven bottom of the vehicle. No blocks shall be placed under couplings.

4.1.7 Pipes from chromium, chrome-nickel and corrosion-resistant steels shall be packaged using wooden or plastic beds.

4.1.8 In order to avoid hitting of pipes against vehicle metal elements or protruding parts of neighbouring pipe bundles, it is recommended to use load platforms with protecting covers.

4.1.9 When attaching pipe bundles to loading platform or deck from chromium, chrome-nickel and corrosion-resistant steels it is required to use nylon cables.

4.2 Handling operations

4.2.1 All handling operations with pipes shall be carried out with thread protectors screwed on pin and coupling ends.

4.2.2 Handling operations with pipe bundles shall be carried out only with the help of hoisting transportation clamps.

In case of manual unloading, rope slings shall be used and pipes shall be rolled along guides in parallel to the pile, avoiding quick movement and collision of pipe ends.

When using the crane, spreader beams with slings shall be used according to approved slinging diagrams.

4.2.3 Pipes shall not be allowed to fall down from heights or be picked up by the pipe end with a hook or be dragged or subjected to any other actions that might damage pin and coupling threads, surfaces or shapes.

4.2.4 Handling operations with chromium and chrome-nickel steel pipes shall be performed using nylon or steel harnesses with plastic braid. When using a forklift, gripping forks, frames and clamps with nonmetallic coating shall be used.

4.2.5 Handling operations for chromium and chrome-nickel steel pipes shall exclude collision of pipes.

4.3 Stockholding and storage

4.3.1 Pipe storage conditions shall comply with GOST 15150 for Group 4 (long-term storage) or Group 8 (short-term storage up to three months and service interruptions).

4.3.2 Pipes, equipment and spare parts storage in warehouses on facilities of production and technical servicing and completing, enterprises and entities shall be according to RD 39-7-904-83.

4.3.3 Pipe bundles shall be stacked on supports spaced in a manner avoiding sagging or thread connection damage. Rack supports shall be located in one plane and shall not sag under the pile weight. Rack bearing surface shall be minimum 11.8110 inch above the ground or floor.

Pipe bundles shall not be stocked on the ground, rails,

steel or concrete floor!

4.3.4 When several pipes bundles are stacked or not bundled pipes are stacked into several ranks, pipe bundles and pipe ranks shall be separated by at least three wooden blocks, with the thickness from 35 to 40 mm each, so that weight of upper pipe ranks is not distributed onto couplings of lower ranks.

The height of the pipe pile shall not exceed 9.8425 ft.

4.3.5 Stockholding of unbundled pipes is allowed provided vertical posts are installed in the racks.

4.3.6 If pipes are rolled on the racks, any movements at an angle to the rack axis shall be excluded as this may result in collision of pins and damage of thread connection or thread protectors.

4.3.7 During pipe storage, availability and integrity of thread protectors, as well as compound underneath shall be inspected. Pipe corrosion shall not be allowed.

4.3.8 Pipes damaged during transportation, rejected during inspection, prepared for repair or awaiting a final decision shall be stored on separate racks with the corresponding information tags.

4.3.9 During pipes from chromium and chrome-nickel steel storage, rack supports shall be equipped with wooden or plastic substrates.

4.3.10 Drilling site shall have a special area for pipe stockholding in compliance with above listed requirements.

4.3.11 Required quantity of racks shall be installed at drilling site in order to provide for stockholding of full set of pipes.

While stacking onto racks it is important to consider the order of string running (if it is specified in the work instruction), to exclude the risk of additional reassorting.

5. Preparation of pipes for make-up

5.1 General provisions

Prior to lifting the pipes onto the rig site, proceed as follows:

- Perform visual inspection of pipes and couplings;
- Remove thread protectors from pipes and couplings;
- Inspect pin and coupling surfaces;
- Drift pipes along the entire length;
- Measure the length of each pipe;
- Reinstall clean thread protectors on pins and couplings.

5.2 Visual inspection

5.2.1 Visual inspection of pipes, couplings and thread protectors shall be performed in order to detect bent pipes, dents and damages.

5.2.2 Visual inspection of pipes and couplings connections shall be carried out with thread protectors screwed on.

5.2.3 Pipes and couplings connections, thread protectors with damages, discovered during visual inspection shall be put aside awaiting decision on their suitability for use.

Amount of damaged pipes shall be specified in the Product Quality Non-conformity Protocol and all damaged areas shall be documented on photographs.

5.2.4 During visual inspection of pipes make sure you pay due attention to additional colour marking of pipes and couplings in the form of circular stripes, indicating (see Table 1):

- that drift performance with the use of special mandrel is required;

Table 1 - Additional colour marking

In what cases circular stripes are applied	Quantity and colour of stripes	
	for pipes	for couplings
- when drift performance with the use of special mandrel is required;	one blue stripe	one blue stripe

5.3 Thread protectors removal

5.3.1 Thread protectors shall be removed after thread connections are visually inspected.

5.3.2 Thread protectors shall be removed manually or using a special tong with one person's effort. In case of difficulties when removing thread protectors, heating of thread protectors with steam is allowed as well as striking slightly with a wooden hammer at a protector end to eliminate a possible distortion.

5.4 Thread connection inspection

5.4.1 Thread connection shall be inspected by the following specialists:

– Crews for casing strings assembly;

– Companies specialized in casing inspection.

When running casing for the first time, representatives of the casing supplier shall be present.

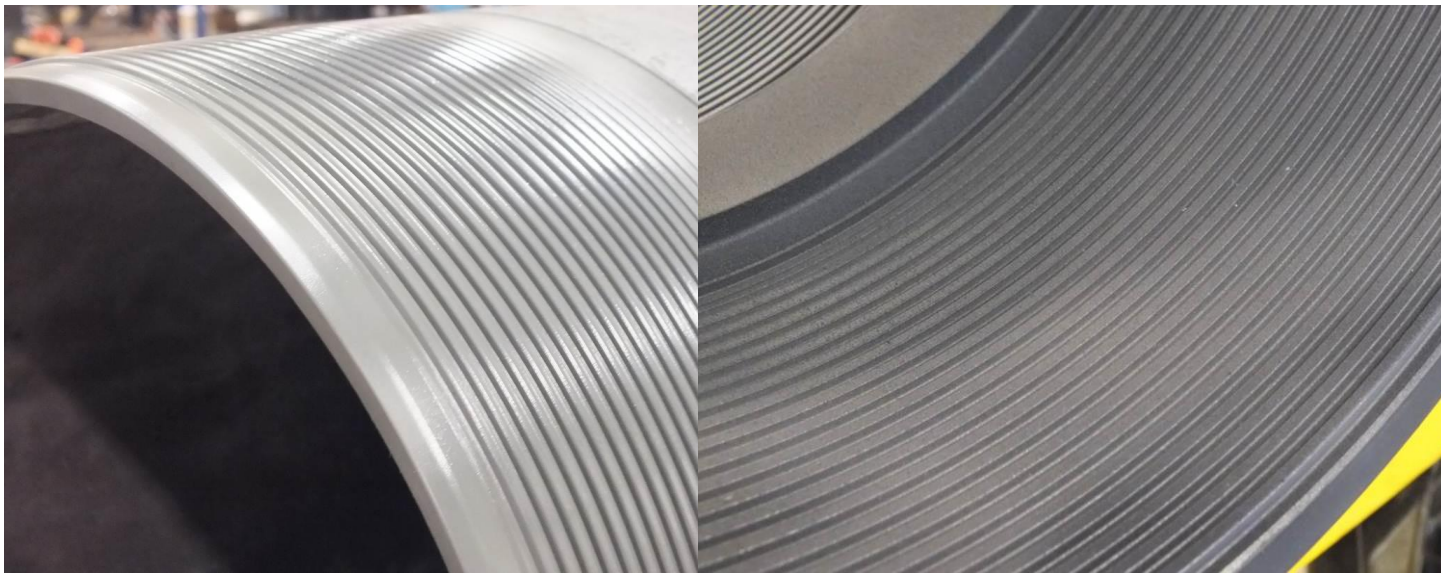
5.4.2 An example of appearance of thread connection with GW compound on pin and coupling is provided in Figures 1 (a, b).

5.4.3 When inspecting pipe and coupling thread connections, make sure you pay due attention to the presence of:

– Damages resulting from pipes collisions or other impacts;

– Damages resulting from installation of thread protectors;

– Rust, corrosion or other chemical damages caused as a result of environmental exposure or due to aggressive agents.



a **b**

Figure 1

5.4.4 Under low light condition (twilight, night) individual portable light sources shall be used during inspection.

5.4.5 Possible damages that might occur on thread connections surface before pipe and coupling putting into operation and the ways of the damages elimination are listed in Table 2 for defined areas of thread connections, indicated in Figure 2.

Thread area with imperfect profile thread on pipes (Area 1 on Figure 2a) has an unfinished surface of thread crests (black-crested threads), corresponding to the surface of pipe body, and interruption of the last thread turns.

N o t e - Surface quality of unfinished thread crests complies with the quality of pipe body surface.

The length of an area of pipe thread with perfect profile and of an area, on which no interruption of thread turns shall be, is determined in accordance with Table 3.

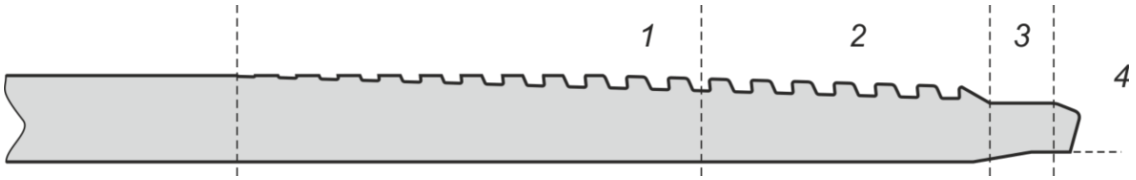
5.4.6 Determination of corrosion depth and damages shall be performed using:

– A mould taken from a detected defect using a special tape (X Coarse material of Testex company for defects up to 0.0039 inch deep, for deeper defects: X-Coarse Plus or equivalent one). Mould height shall be measured with a thickness gage; measurement accuracy shall be at least 0.0004 inch (PEACOCK G2-127 gage or equivalent one);

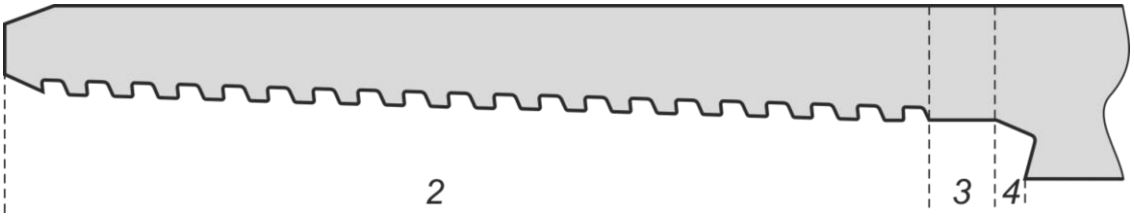
– Depth gage with a needle-type contact point (contact point diameter shall be maximum 0.0039 inch), measurement accuracy shall be at least 0.01 mm (PEACOCK T-4 gage or equivalent one).

Table 2 - Types of possible damages of thread connections surface before putting into operation and methods of their repair

Surface area (Figure 2)	Type of damage	Damage repair method
1.2	Surface corrosion (rust), surface corrosion with the depth of not more than 0.0039 inch	Removal using corrosion converters followed by dry cloth wiping Manual repair (removal) using non-metal brush with soft bristle or polishing paper with grain 0
	Pit corrosion more than 0.0039 inch deep	Not to be repaired
	Dents, nicks, grooves and other defects with the depth of not more than 0.0039 inch	Manual repair using needle file or polishing paper with grain 0
	Dents, nicks, grooves and other defects with the depth of not more than 0.0039 inch	Not to be repaired
3	Surface corrosion (rust), surface corrosion with the depth of not more than 0.0118 inch	Removal using corrosion converters followed by dry cloth wiping Manual repair using needle file or polishing paper with grain 0
	Pit corrosion more than 0.0118 inch deep	Not to be repaired
	Dents, nicks, grooves and other defects with the depth of not more than 0.0039 inch	Manual repair using needle file or polishing paper with grain 0
	Dents, nicks, grooves and other defects with the depth of not more than 0.0039 inch	Not to be repaired
4	Pit corrosion of any depth	Not to be repaired
	Surface corrosion (rust),	Removal using corrosion converters followed by dry cloth wiping Repair by buffing
	Grooves removed by buffing	Repair by buffing
	Dents, nicks and other defects of any depth	Not to be repaired



a) – Surface of external thread connection



b) – Surface of internal thread connection

1 - imperfect profile of thread; 2 - perfect profile of thread;

3 – cylinder groove or bore; 4 - seal and thread shoulders.

Figure 2

Table 3 - Length of thread area with perfect profile and an area without interruption of thread turns

In inches

Pipe outside diameter. D	**Length of thread area with perfect profile** Not less than [1)]	**Length of thread area without interruption of thread turns,** not less than [1)]
4	1.4567	2.7953
4 1/2	1.4567	3.2677
5	1.4567	3.2677
5 1/2	1.4961	3.3465
6 5/8	1.6929	3.5039
7	1.8898	3.7008
7 5/8	2.0866	3.8583
	3.5039 [2)]	4.6063 [2)]
7 3/4	2.0866	3.8583
8 5/8	2.2047	4.0157
9 5/8	2.2047	4.0157
9 7/8	2.2047	4.0157
10 3/4	2.2047	3.9764
	3.5039 [3)]	4.6063 [3)]
11 3/4	2.2047	3.9764
11 7/8	2.2047	3.9764
12 3/4	2.2047	3.9764
13 3/8	2.2047	3.9764
13 5/8	2.2047	3.9764

[1)] Measurement of the length of areas is carried out from the end face of pipe.
[2)] for the walls of 0.6870 and 0.7500 inch
[3)] for the walls of 0.5949 and 0.6720 inch

5.4.7 If any irreparable damages are detected on pipes, such pipes shall be rejected then and reported accordingly specifying pipes serial numbers, describing damages found with photos attached.

5.5 Drifting

5.5.1 Drifting shall be performed using a standard or special mandrel along the entire length of pipes (see Table 1):

- standard mandrel - if pipes and couplings do not have additional colourful marking
- special mandrel - if one circular stripe of blue colour is applied on pins and couplings.

For drifting of pipes made of chromium, chrome-nickel and corrosion-resistant steels, polymer or aluminium mandrels shall be used.

5.5.2 Before drifting, the pipe shall be positioned in such a manner as to avoid sagging. If any ropes or bars are used for the drifting process, they shall be clean. In case of freezing temperatures pipes shall be heated prior to drifting, to remove snow and ice crust.

5.5.3 Pipe and drift shall be of the same temperature during drifting process.

5.5.4 Dimensions of the mandrel effective part shall comply with values specified in Table 4 and in Table 5.

5.5.5 The mandrel shall pass through the entire pipe, when pulled manually without significant effort.

Pipes rejected during drifting process, shall be put aside until further decision on their validity and recorded in product quality non-compliance report.

Table 4 – Dimensions of the effective part of mandrel

In inches

Pipe outside diameter	Length of the effective part of the mandrel, inch	Diameter of the effective part of the mandrel, inch
Above 2 7/8	42.0079 [1)]	d – 0.1252
up to 8 5/8 incl.	5.9843	*d* – 0.1252
From 9 5/8 to 13 3/8 incl.	12.0079	d – 0.1563
Above 13 3/8	12.0079	d – 0.1874

[1)] Drifts with the effective part 49.2126 inch are allowed to be used.
N o t e – *d* is a pipe inside diameter.

Table 5 – Dimensions of the effective part of special mandrel

In inches

Outside Pipe outside diameter, D	Wall thickness Of pipes, *S*	Dimensions of the effective part of a special mandrel, not less than	
		of special	
		Length	Outside diameter
7	0.4079	5.9843	6.1252

5.6 Measurement of length of pipes

5.6.1 Length of each pipe shall be measured from free (without a thread protector) coupling end face to free (without a thread protector) pin end face.

It is recommended to compare measured pipe length with the marked length. In case of discrepancies the measured length shall be marked on the pipe body with a marker or a chalk.

5.6.2 When calculating the total length of the string, one should use the formula specified below

$$L = \sum L_{\Phi} - n\,\Delta L \qquad (1)$$

where L – the total length of the string;

$\sum L_{\Phi}$ – the total length of all the pipes in a string, measured from pin end face to free coupling end face;

n – number of pipes in a string;

ΔL – decrease of pipes length during make-up according to Table 6.

Table 6 – Decrease of pipes length during make-up process

In inches

Pipe outside diameter	Decrease of pipe length during make-up Δ*L*
4	3.5472
4 1/2	4.0787
5	4.2008
5 1/2	4.2638
6 5/8	4.4843
7	4.6732
7 5/8	4.9173
	5.3150 [1)]
7 3/4	4.9134
8 5/8	5.0394
9 5/8	5.0394
9 7/8	5.0394
10 3/4	5.0787
	5.3150 [1)]
11 3/4	5.0787
11 7/8	5.0787
12 3/4	5.0787
13 3/8	5.0787
13 5/8	5.0787

[1)] for the walls of 0.6870 and 0.7500 inch
[2)] for the walls of 0.5949 and 0.6720 inch

5.7 Thread protectors installation

5.7.1 After inspection and control, thread protectors shall be re-installed on pin and coupling ends.

5.7.2 Before installation thread protectors shall be thoroughly cleaned and shall have no significant damages, affecting protection of thread and seal against direct contact with exposure.

6. Make-up of pipes

6.1 Running and pulling

6.1.1 Casing shall be assembled by a qualified personnel. Make-up of connection with the use of torque registration system and make-up diagram plotting is the method ensuring proper make-up and claimed by the manufacturer technical properties of the connection.

Methods of make-up inspection with the use of manometer of breakout tong, make-up triangle (transverse stripe), do not ensure proper make-up and can be used by the user at his own and sole discretion without any guarantees on behalf of PAO “TMK” to get the claimed by the manufacturer technical properties of the connection.

6.1.2 A special bell guide is recommended for running and pulling operations (Figure 3). This device helps to align pin and coupling and prevent the connection from damage.

6.1.3 In order to decrease the risk of new damages during running and pulling operations, it is recommended to use pipe weight balancer.

In case of non-operating state of pipe weight balancer or its absence, a driller shall control constant weight on hook (within limits ±100 kg (±220.46 lb)) taking into consideration pipe weight.

6.1.4 While running a string of chrome and chrome-nickel steel pipes it is recommended to use an elevator and special wedge claws to avoid pipe body damages.

Figure 3

6.1.5 Rotary tongs or casing make-up system shall be equipped with a speed governor and shall ensure :

- at the initial stage - speed of make-up of not more than 2 rpm; safe entering of external thread into internal thread (reverse is allowed).

- at the stage of the main make-up - smooth rotation of a pipe at the speed of not more than 10 rpm;

- at the stage of rotation on shoulder - the speed of make-up is not more than 2 rpm and smooth rotation of a pipe without jerks and stops.

If break-out of thread connection is needed according to para 6.5 and with the use of casing make-up system, it is required to prepare a rotary tong.

Rotary tongs shall be equipped with clamps for specific pipe sizes to ensure a sufficient contact area with the pipe body. Clamps diameter shall be 1 % greater than pipe nominal outside diameter. Clamps shall be adjusted in such a way that they hold the pipe tightly and never slip.

For make-up and break-out of chromium and chrome-nickel steel pipes, the rotary tongs shall be equipped with non-metal or non-injurious tong dies.

Prior to make-up, tongs shall be positioned as per Figure 4.

6.1.6 Make-up equipment shall ensure torque at least 30% greater than recommended maximum make-up torque.

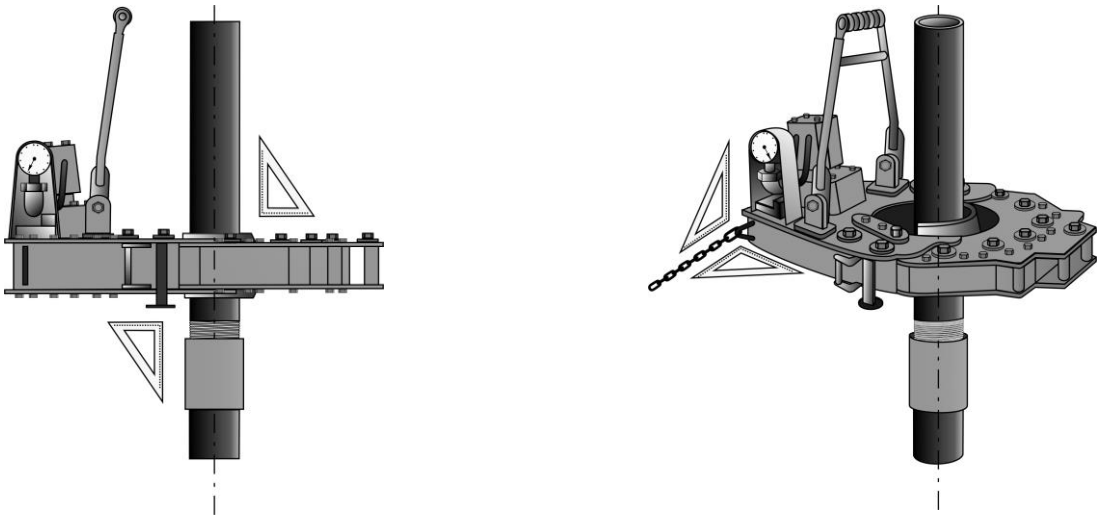


Figure 4

6.2 Assembly of string

6.2.1 Make sure thread protectors are secured in place prior to lifting pipes onto the rig floor.

Lifting pipes to the rig floor without thread protectors or end caps (clepo) is not allowed!

6.2.2 Prior to assembly of the string, remove thread protectors or end caps (clepo) and check surfaces of thread seals and thread shoulders of the free pin for any mechanical damage according to Figure 5.

6.2.3 During make-up process, if a derrick man is absent, it is required to control alignment of upper pipe (decline) with lower pipe axis and correct the situation timely

by directing a driller accordingly (topdrive turn, elevator movements up and down, etc.). (Figure 6).

Maximum misalignment of connected pipes shall not exceed 0.7874 inch.

6.2.4 Prior to make-up, perform air blasting of external and internal threads and make sure, that surfaces of thread, thread seals and thread shoulders are free from mud or mud laden fluid with small contaminations, hindering tightness of connection. In case of mud or mud laden fluid on connection surfaces, clean them.

6.2.5 In case of combined make-up (one end of thread connection with GW compound is made-up with an end without compound), thread compound shall be applied according to Annex B.

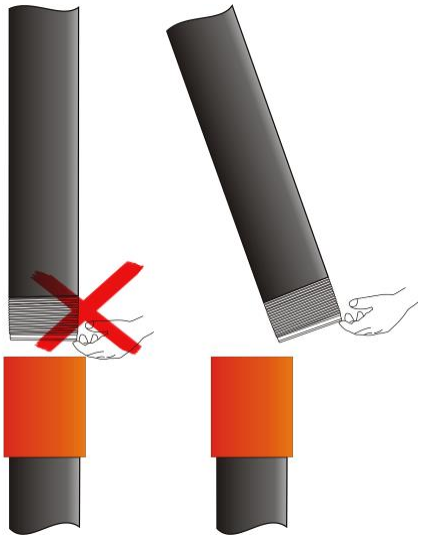


Figure 5

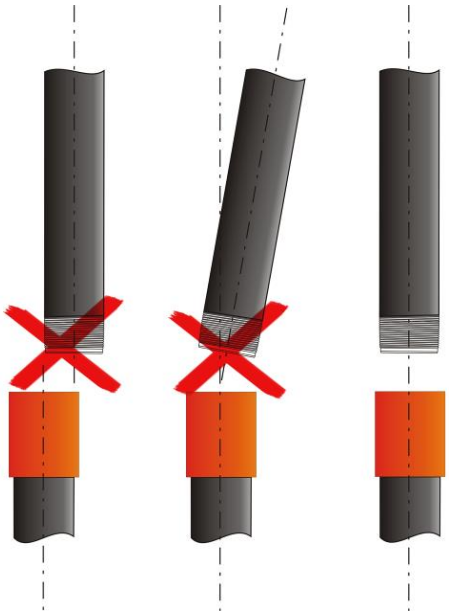


Figure 6

6.2.6 When stabbing a pin into a coupling, pin end-face shall not hit coupling end-face, pin sliding down into the coupling is not allowed.

6.2.7 The make-up torque for a thread connection shall be within the range from the minimum up to the maximum torques, specified in Table 7 for the corresponding size of pipes and grades taking into consideration additional colourful marking (see Table 1).

If thread connection make-up with torque within the limits shown in Table 7 is not in compliance with specified requirements, M_{opt} may be corrected but not more than by +30 %. At that, the values of M_{min} and M_{max} shall be corrected but not more than by ±10 % of corrected M_{opt}.

6.2.8 During make up of pins and couplings (or equipment) made of steels of different grades, the make-up torque value shall be chosen according to the lowest steel grade of both pin and coupling.

6.2.9 Make-up of pins and couplings shall be performed with the use of make-up registering equipment, by make-up diagrams, at that it shall meet the requirements specified in Annex A.

Make-up of pipes and couplings without registering equipment shall be performed based on make-up torques and make-up mark applied on pin free end (Figure 7). A transverse stripe (in light paint) can be made on the pin instead of the make-up triangle, in such a case a triangular sign (in light paint), denoting position of the make-up triangle, shall not be painted.

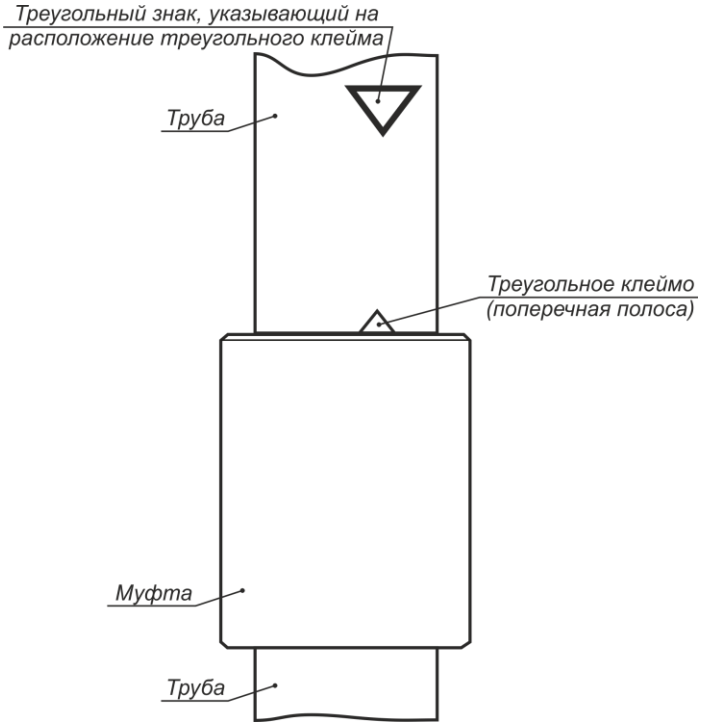


Figure 7

When make-up is checked by triangle marking (transverse stripe), correct make-up is proved by alignment of coupling end face with the base of make-up triangle (transverse stripe near edge) on pipe with allowable deviation ±0.0394 inch.

Above inspection methods are secondary, and they do not provide for assessment of make-up quality.

Table 7 – Make-up torques

D. Inch	*S.* Inch	Torque. ft lb for steel grades																										
		J55, K55			N80, L80			C90			R95, T95			C110, P110			Q125			TMK135, Q135			TMK140			TMK150		
		M_{min}	M_{opt}	M_{max}	M_{min}	M_{opt}	M_{max}	M_{min}	M_{opt}	M_{max}	M_{min}	M_{opt}	M_{max}	M_{min}	M_{opt}	M_{max}	M_{min}	M_{opt}	M_{max}	M_{min}	M_{opt}	M_{max}	M_{min}	M_{opt}	M_{max}	M_{min}	M_{opt}	M_{max}
4	0.2559	3500	3900	4300	3700	4100	4500	3800	4300	4700	4100	4600	5000	4500	5000	5500	5000	5600	6200	5200	5800	6300	5200	5800	6300	5500	6000	6600
4 1/2	0.2500	3200	3600	4000	4300	4700	5200	4600	5200	5700	4800	5300	5800	5200	5800	6300	5700	6300	7000	6300	6900	7600	6500	7200	8000	6700	7400	8200
	0.2902	3800	4300	4700	4900	5400	5900	5500	6000	6600	5600	6200	6800	6000	6700	7400	6700	7400	8200	7200	8000	8800	7600	8400	9200	7800	8700	9600
	0.3370	4100	4500	4900	5300	5900	6500	5900	6600	7200	6000	6700	7400	6600	7400	8100	7300	8100	8900	7800	8700	9600	8300	9200	10200	8600	9600	10500
5	0.2961	4300	4700	5200	5200	5800	6400	5700	6300	6900	5700	6300	6900	6300	7100	7800	7000	7800	8600	7700	8600	9400	8100	9000	9900	8400	9400	10300
	0.3618	5200	5800	6300	6400	7200	7900	6900	7700	8400	6900	7700	8400	7800	8700	9600	8600	9600	10500	9500	10500	11600	10000	11100	12200	10300	11500	12700
	0.4370	5900	6600	7200	7400	8300	9100	8400	9400	10300	8400	9400	10300	9300	10300	11400	10400	11600	12800	10900	12100	13300	11500	12800	14000	11900	13300	14600
	0.4780	6400	7200	7900	8100	9000	9900	9200	10300	11300	9200	10300	11300	10300	11400	12500	11400	12700	13900	11900	13300	14600	12600	14000	15400	13100	14500	16000
	0.5000	6800	7500	8300	8500	9400	10400	9700	10700	11800	9700	10700	11800	10700	11900	13100	11900	13300	14600	12500	13900	15300	13200	14700	16200	13600	15200	16700
5 1/2	0.2748	4400	4900	5500	5500	6100	6700	6100	6800	7400	6100	6800	7400	6900	7600	8300	7600	8400	9200	8000	8900	9800	8500	9400	10400	8800	9800	10800
	0.3039	4900	5500	6000	6000	6700	7400	6800	7500	8300	6800	7500	8300	7600	8400	9200	8300	9300	10300	8900	9900	10800	9400	10500	11500	9700	10800	11900
	0.3610	5700	6300	6900	6600	7400	8100	7500	8300	9100	7500	8300	9100	8800	9700	10700	9700	10800	11900	9700	10800	11900	10300	11400	12600	10700	11900	13100
	0.4150	6500	7200	8000	7600	8400	9200	8600	9600	10500	8600	9600	10500	10000	11100	12200	11100	12400	13600	11100	12400	13600	11700	13000	14300	12200	13600	14900
	0.4760	7500	8300	9100	8700	9700	10600	9900	11000	12100	9900	11000	12100	11600	12800	14100	12800	14200	15600	12800	14200	15600	13500	15000	16400	14000	15600	17100
6 5/8	0.2882	7300	8100	8900	8800	9800	10800	10000	11100	12200	10000	11100	12200	11300	12500	13800	12400	13800	15200	13000	14500	15900	13600	15200	16700	14300	15900	17500
	0.3150	8700	9700	10600	10500	11700	12800	12000	13300	14700	12000	13300	14700	13900	15500	17000	14900	16500	18100	15500	17200	18900	16400	18200	20100	17000	19000	20900
	0.3520	8900	9900	10800	10800	11900	13100	12300	13600	15000	12300	13600	15000	13800	15300	16900	15100	16800	18500	15800	17600	19300	16700	18500	20400	17300	19200	21100
	0.4169	10600	11800	13000	12800	14200	15600	14500	16100	17700	14500	16100	17700	16300	18100	20000	17900	19900	21900	18700	20800	22900	19800	22000	24200	20600	22900	25100
	0.4748	12000	13300	14700	14500	16100	17700	16400	18300	20100	16400	18300	20100	18600	20600	22700	20400	22600	24900	21400	23700	26100	22400	24900	27400	23400	26000	28500
7	0.3169	7700	8500	9400	9900	11000	12100	11000	12200	13500	11000	12200	13500	12100	13400	14700	13600	15000	16500	14500	16100	17700	15300	17000	18700	15900	17700	19500
	0.3618	8800	9700	10700	11200	12500	13700	12500	13900	15300	12500	13900	15300	13800	15300	16900	15400	17100	18800	16400	18300	20100	17500	19400	21300	18100	20100	22100
	0.4079	9900	11000	12100	12700	14100	15500	14100	15600	17200	14100	15600	17200	15600	17300	19000	17400	19300	21200	18700	20700	22800	19600	21800	24000	20400	22600	24900
		9900[1)]	11000[1)]	12100[1)]	12700[1)]	14100[1)]	15500[1)]	14100[1)]	15600[1)]	17200[1)]	14100[1)]	15600[1)]	17200[1)]	15600[1)]	17300[1)]	19000[1)]	17400[1)]	19300[1)]	21200[1)]	18700[1)]	20700[1)]	22800[1)]	19600[1)]	21800[1)]	24000[1)]	20400[1)]	22600[1)]	24900[1)]
	0.4531	11000	12200	13500	14200	15800	17300	15800	17600	19300	15800	17600	19300	17400	19300	21200	19400	21500	23700	20900	23200	25400	22000	24400	26800	22900	25400	27900
	0.4980	12100	13400	14700	15600	17300	19100	17400	19300	21200	17400	19300	21200	19100	21200	23400	21200	23600	26000	22900	25500	28100	24300	26900	29600	25100	27900	30800
	0.5402	14300	15900	17500	17600	19500	21500	19500	21700	23800	19500	21700	23800	22200	24600	27100	24600	27400	30100	25900	28800	31600	27100	30200	33200	28200	31300	34500
	0.6252	16800	18700	20500	20800	23100	25400	23100	25700	28200	23000	25600	28200	26300	29100	32100	29100	32300	35500	29900	33200	36500	29900	33200	36500	29900	33200	36500
	0.6870	18700	20800	22900	23100	25700	28200	25600	28500	31300	25600	28400	31300	29100	32300	35500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500
7 5/8	0.3280	10800	12000	13200	12800	14200	15600	14500	16100	17700	14500	16100	17700	15600	17300	19100	17000	18900	20800	18900	20900	23000	19900	22100	24300	20600	22900	25200
	0.3748	13000	14500	15900	15900	17600	19400	18200	20200	22200	18200	20200	22200	20300	22600	24900	21900	24300	26800	23400	26000	28500	24600	27300	30000	25500	28300	31100
	0.4299	14900	16500	18100	18200	20200	22200	20800	23100	25400	20800	23100	25400	23400	26000	28500	25100	27900	30800	26700	29600	32600	28200	31300	34400	29200	32400	35700
	0.5000	17300	19200	21100	21100	23500	25800	24300	26900	29600	24300	26900	29600	27100	30100	33100	29200	32400	35700	29900	33200	36500	29900	33200	36500	29900	33200	36500
	0.5618	19500	21600	23700	23700	26400	29100	27100	30200	33200	27100	30200	33200	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500
	0.5949	21500	23900	26300	27000	30000	33000	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500
	0.6870	20600	22900	25200	27000	30000	33000	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500
	0.7500	22300	24700	27200	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500
7 3/4	0.5949	21500	23800	26200	27500	30500	33600	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500
8 5/8	0.3520	13900	15400	17000	16300	18100	20000	20200	22400	24600	20200	22400	24600	21900	24300	26800	23200	25700	28300	24000	26600	29300	25400	28200	31000	26300	29200	32200
	0.4000	15600	17400	19200	18600	20600	22700	21600	24000	26400	21600	24000	26400	24200	26800	29500	26400	29400	32300	27400	30400	33400	28800	31900	35100	29900	33200	36500
	0.4500	17600	19600	21600	20900	23200	25400	24300	27000	29700	24300	27000	29700	27100	30200	33200	29700	33000	36400	29900	33200	36500	29900	33200	36500	29900	33200	36500
	0.5000	19600	21800	24000	23200	25800	28400	27100	30100	33100	27100	30100	33100	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500
	0.5571	21900	24300	26800	25900	28800	31600	28500	31700	34900	28500	31700	34900	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500

End of Table 7

D, Inch	*S*, Inch	Torque, ft lb for steel grades																											
		J55, K55			N80, L80			C90			R95, T95			C110, P110			Q125			TMK135, Q135			TMK140			TMK150		
		M_{min}	M_{opt}	M_{max}	M_{min}	M_{opt}	M_{max}	M_{min}	M_{opt}	M_{max}	M_{min}	M_{opt}	M_{max}	M_{min}	M_{opt}	M_{max}	M_{min}	M_{opt}	M_{max}	M_{min}	M_{opt}	M_{max}	M_{min}	M_{opt}	M_{max}	M_{min}	M_{opt}	M_{max}
9 5/8	0.3520	14500	16100	17700	17100	19000	20900	19000	21100	23200	19000	21100	23200	20400	22600	24900	22300	24800	27300	25100	27900	30800	26500	29500	32400	27600	30600	33700
	0.3949	16400	18300	20100	19800	22100	24300	22100	24500	26900	22100	24500	26900	24300	27000	29700	26600	29600	32500	29100	32400	35600	29900	33200	36500	29900	33200	36500
	0.4350	18400	20400	22500	22400	24900	27400	25100	27900	30800	25100	27900	30800	28300	31500	34700	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500
	0.4720	20400	22700	25000	25900	28800	31600	29600	32800	36100	29600	32800	36100	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500
	0.5449	23600	26300	28900	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500
	0.5949	25800	28700	31600	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500
9 7/8	0.6252	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500
	0.6610	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500
	0.7201	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500
10 3/4	0.3500	16300	18100	19900	20700	23000	25300	23400	26000	28500	23400	26000	28500	25600	28400	31300	29500	32700	36000	29900	33200	36500	29900	33200	36500	29900	33200	36500
	0.4000	20700	23000	25300	25600	28400	31300	29500	32700	36000	29500	32700	36000	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500
	0.4500	23400	26000	28500	28800	31900	35100	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500
	0.4949	25600	28500	31300	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500
	0.5449	28200	31300	34500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500
	0.5949	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500
	0.6720	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500
11 3/4	0.3331	22000	24400	26800	26800	29800	32700	27900	31000	34100	29200	32400	35700	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500
	0.3748	23400	26000	28500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500
	0.4350	27000	30000	33000	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500
	0.4890	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500
	0.5339	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500
	0.5819	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500
11 7/8	0.5500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500
	0.5819	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500
12 3/4	0.3740	20400	22700	25000	26300	29300	32200	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500
	0.4331	23700	26400	29100	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500
	0.4882	26700	29600	32600	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500
	0.5512	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500
13 3/8	0.3799	25200	28000	30800	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500
	0.4299	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500
	0.4799	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500
	0.5142	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500
	0.5512	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500
	0.6063	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500
13 5/8	0.5551	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500
	0.6252	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500
	0.7598	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500	29900	33200	36500

[1)] If one circular stripe of blue colour is applied on pins and couplings (during inspection of passability using a special mandrel),

N o t e

1, The grades specified without types include all the types,

2, Make-up with special couplings shall be performed with torques 20% less than the specified ones,

3, When making-up pipes with the grades not specified in present Table, refer to the torque provided in regulatory documentation for these pipes,

6.2.10 At the initial stage of assembling it is recommended to perform the first two revolutions of pipe using strap tongs (chain tongs are allowed for use only with the safe gasket which is set between the pipe body and the tong thus avoiding pipe body damage) to assure connection of external and internal threads, i.e. entering of external thread profile in mating profile of internal thread.

At this stage pipe reversal half-revolution is allowed for steady continuation of make-up without threads overlapping and high-quality assembly.

6.2.11 When making-up pipes from chromium and chrome-nickel steels, the first two turns shall be carried out manually, or strap tongs can be used (Figure 8). Chain tong is allowed for use only provided that the pipe body is secured from damage (e.g. by the safe gasket which is set between the pipe body and the tong).

Figure 8

6.2.12 Make-up rotation speed during connection make-up with the rotary tong shall correspond to the values specified in Table 8.

Table 8 – Rotation speed during make-up

Start of make-up		**End of make-up (rotation on shoulder)**
First two turns	**Further turns**	
Speed maximum 2 rpm, Better manually	Speed Not more than 10 rpm	Speed maximum 2 rpm

6.2.13 Even longitudinal movement of the pipe resulting from gradual increase of number of engaged revolutions shall be watched, significant warming of the connection (not more than 122F of the ambient temperature) shall not be allowed.

6.2.14 Make-up shall not cause significant mechanical damages like galling, jamming or other imperfections on pipe and coupling body.

The outer surface of coupling shall be free of damages with the depth larger than 0.5% of the coupling nominal outside diameter.

Damages from tong clamps are allowed on the pipe outer surface provided that the actual pipe wall thickness, taking into account depth of the damage, shall be not less than 87.5% of the nominal pipe wall thickness.

After make-up of chromium and chrome-nickel steel pipes, the trace depth on the pipe body shall be not more than 0,0079 inch.

6.2.15 When using hydrotongs with back up, the following conditions shall be observed:

On the first rotations (better manually, using a chain tong), back up shall be opened, and make-up shall be performed without make-up torque increase. At that it is possible to make horizontal movements of hydrotong (right/left) to prevent thread bite during make-up.

Upon increase of make-up torque (on the last 3 turns), it is required to stop, fix the back up on lower pipe body (fixing of back up on coupling is not allowed) and continue make-up.

If for make-up of thread connection hydrotong is used not equipped with back up which serves as an arrester it is required to use a mechanical universal tong with a fixing function on lower pipe body.

6.2.16 When the value of the final make-up torque equal to M_{max} value is achieved, turning of coupling from the side of mill connection is allowed, if the make-up diagram has not been changed (Figure 10). The final make-up torque values shall be within M_{min} to M_{opt} limits in order to reduce the probability of turning.

6.3.17 When mud fluid is added into the string, in order to avoid mud fluid on thread and box thread shoulder thread protectors need to be used, Figure 9a, it is allowed to use thread protectors machined (with thread removed), Figure 9b.

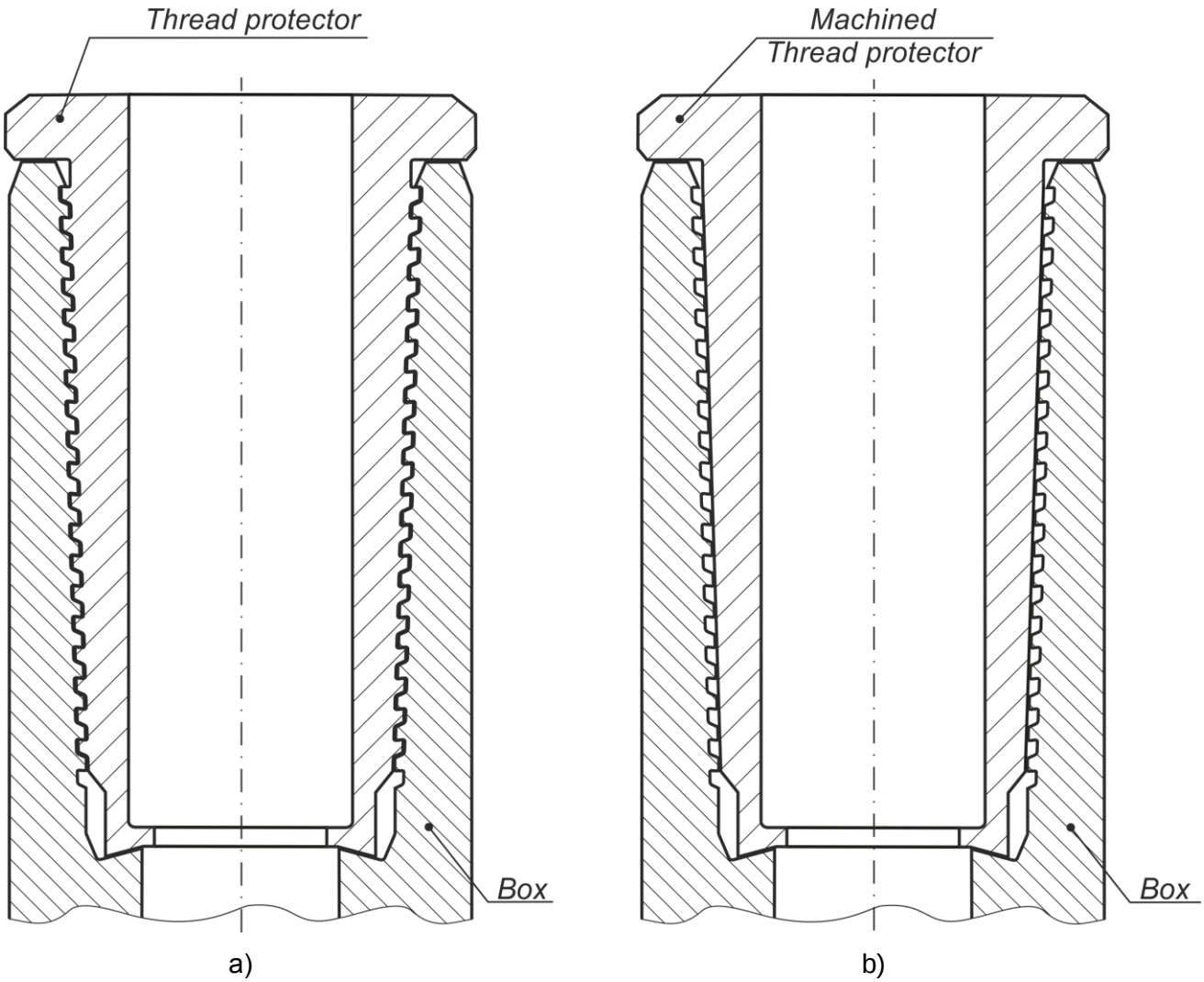


Figure 9

6.3 Make-up inspection by the make-up diagram

6.3.1 General Requirements

6.3.1.1 The shoulder torque M_{sh} of thread shoulders (box shoulder and pin shoulder) shall be within the range between 15 % and 80 % of the optimum make-up torque M_{opt}.

6.3.1.2 The final make-up torque shall be within the range from the minimum M_{min} to the maximum M_{max} make-up torques.

6.3.1.3 Typical cases of make-up diagram shape non-compliance are shown in Figures 11 – 15.

6.3.1.4 If the make-up curve is of improper shape, giving rise to doubt in make-up quality, break out the connection.

After break-out the surface of pin and coupling thread connections shall be visually inspected.

If no surface damages and (or) shape distortion (decrease of pin or box shoulder inside diameter, sagging on coupling inside surface) are observed, it is necessary to check the settings of equipment, alignment of made-up pipes shall be checked, make sure there is no slippage of clamp jaws and make-up the connection again.

- If surface damages are observed and can be repaired in accordance with para 6.4.8. the settings of equipment for make-up, alignment of made-up pipes shall be checked, make sure there is no slippage of clamp jaws and make-up the connection again. If the damages observed cannot be repaired it is necessary to reject the connection.

If the shape of the make-up diagram after re-make-up is similar to the shape of the first make-up diagram, the pipe shall be laid aside and make-up with another pipe shall be performed. The laid aside pipe is allowed to be used for further make-up if no damages are observed or the damages are repaired. Reapply thread compound of the appropriate type and quality, check the settings of equipment.

Pipes on which pin or coupling were made up three times with replacement of counter pipe and with make-up diagrams of a wrong form shall be rejected.

6.3.2 Correct make-up diagram

6.3.2.1 If make-up is performed correctly and all the thread connection geometric parameters comply with the established requirements, the make-up diagram (Figure 10) clearly shows defined areas, which correspond to torque increase due to mating of thread surfaces (area I), thread and sealing element (section II), thread, sealing and shoulder elements (area III).

6.3.2.2 The torque increase on the first revolutions of make-up corresponding to the initial mating of thread shall be smooth and even. Torque shall increase upon further mating of thread, mating of sealing elements. The moment of shouldering is followed by sharp increase of torque thus confirming correct process of make-up.

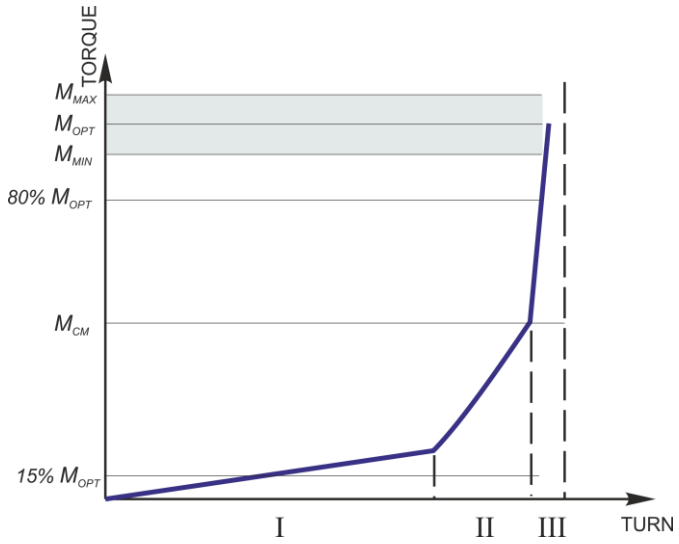


Figure 10

6.3.2.3 Depending on the rotary tong used, its adjustment and other factors, the make-up diagram especially in area I can show areas with insignificant deviations from the straight line: oscillations, leaps, etc. Such deviations shall be deemed acceptable, provided that peak values do not exceed the shoulder torque M_{sh} value, and it is possible to track areas of mating of thread, seals and shoulders on the diagram.

6.3.3 Make-up diagram when torque increase stops

If at the final step of make-up procedure torque increase stops and there appears a horizontal area (area IV, Figure 11), but no slippage of clamp jaws is observed, actions shall be taken according to para 6.3.1.4.

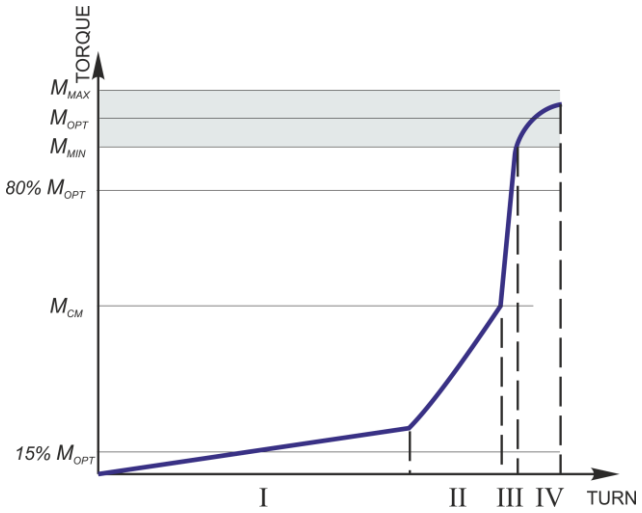


Figure 11

6.3.4 Make-up diagram when torque is low

Too low value of shoulder torque M_{sh} (below 15% of Mopt) on the make-up diagram (Figure 12) may result from:

- Defects of load sensor.

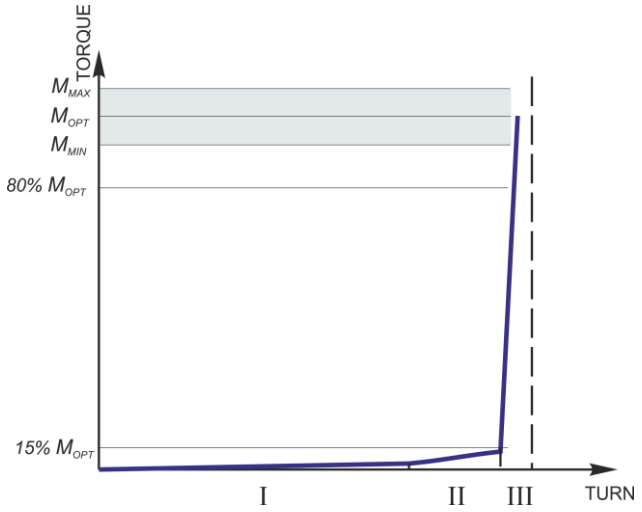


Figure 12

If the make-up curve is of improper shape, the following actions shall be taken according to para 6.3.1.4.

6.3.5 Make-up diagram when torque is high

Too high value of shoulder torque (M_{sh}) (over 80% of M_{opt}) on the make-up diagram (Figure 13) may result from:

- Damage of thread and/or thread seals;
- Foreign inclusions between thread turns;
- Defects of load sensor.

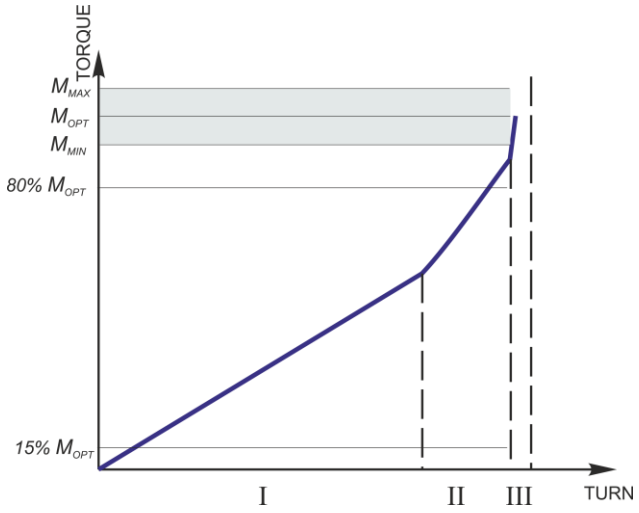


Figure 13

If the make-up curve is of improper shape, the following actions shall be taken according to para 6.3.1.4.

6.3.6 Make-up diagram with torque leaps

Torque leaps on the make-up diagram (Figure 14) may result from:

- Uneven application of thread compound;
- Misalignment of the equipment for make-up;
- Misalignment of made-up pipes;
- Insufficient force of rotation on shoulder;
- Slippage of clamp jaws.

Such a diagram is considered good and may be accepted provided that requirements specified in para. 6.3.2.3 are met.

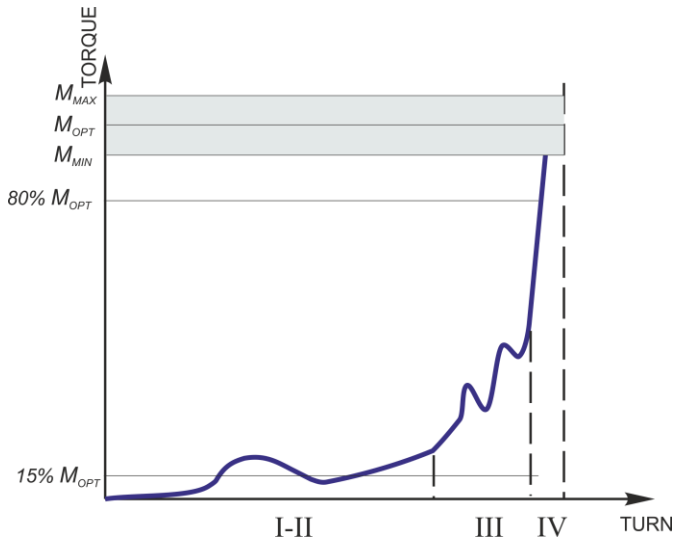


Figure 14

In case of any doubts concerning the make-up quality, the following actions shall be taken according to para 6.3.1.4.

6.3.7 Make-up diagram with a wave-like effect

Make-up curve with a wave-like effect (Figure 15), may result from:

- Uneven application of thread compound;
- Foreign inclusions between thread turns;

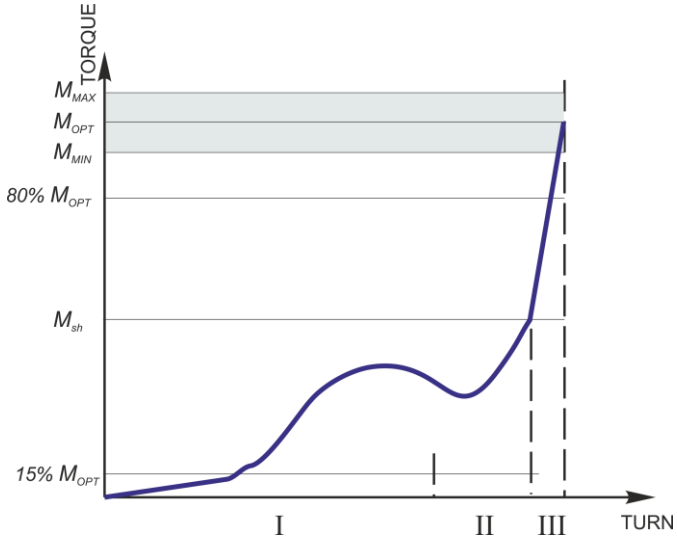


Figure 15

Such a diagram is considered good and may be accepted provided that requirements specified in para. 6.3.2.3 are met.

In case of any doubts concerning the make-up quality, the following actions shall be taken according to para 6.3.1.4.

6.4 Break-out of string

6.4.1 Prior to break-out, the rotary tongs shall be positioned as per Figure 4.

6.4.2 Prior to start break-out of connection hydro tong back-up shall be fixed on coupling of lower pipe of a broken-out connection. If for break-out of connection hydro tong is used not equipped with back up or casing make-up system which serves as an arrester it is required to use a mechanical universal tong with a fixing function on coupling of lower pipe of a broken-out thread connection (fixing of back up on lower pipe body is not allowed, for the purpose of excluding breaking-out of mill connection).

6.4.3 When the string is being pulled out of the well, pin end face is not allowed to hit against coupling end face.

6.4.4 Even longitudinal movement of the pipe resulted from gradual increase of number of engaged turns, shall be watched when the connection is broken-out.

A driller fixes the weight on a hook load free, provides tension within 220.5÷330.7 lbs, and tries to maintain these values in the process of breaking-out. On the last turn pipe moving up shall be stopped in order to fix thread run-out (a click) and after that the pin shall be moved out of the coupling.

6.4.5 Break-out torque shall provide for the connection disassembly.

Reduce of thread connection break-out torque by 20% relative to the recommended optimum make-up torque M_{opt} is allowed.

6.4.6 Make-up rotation speed during connection make-up with the rotary tong shall correspond to the values specified in Table 9.

Table 9 – Rotation speed during break-out

Start of break-out		End of break-out
First two turns	Further turns	
Speed maximum 2 rpm,	Speed maximum 10 rpm	Speed maximum 2 rpm

6.4.7 Break-out shall not cause significant mechanical damages like galling, jamming or other imperfections on pipe and coupling body.

The outer surface of coupling shall be free of damages with the depth larger than 0.5% of the coupling nominal outside diameter.

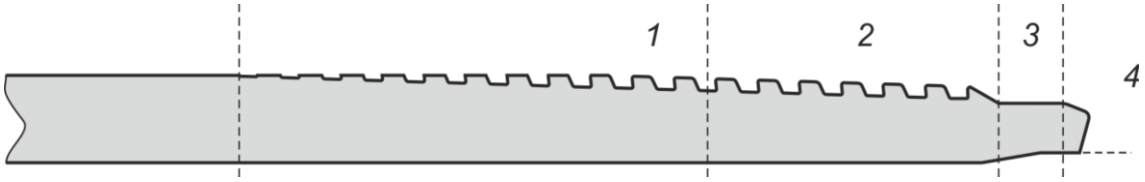
Damages from tong clamps are allowed on the pipe outer surface provided that the actual pipe wall thickness, taking into account depth of the damage, shall be not less than 87.5% of the nominal pipe wall thickness.

After break-out of chromium, chrome-nickel and corrosion-resistant steel pipes the mark on the pipe body shall not be deeper than 0,0079 inch.

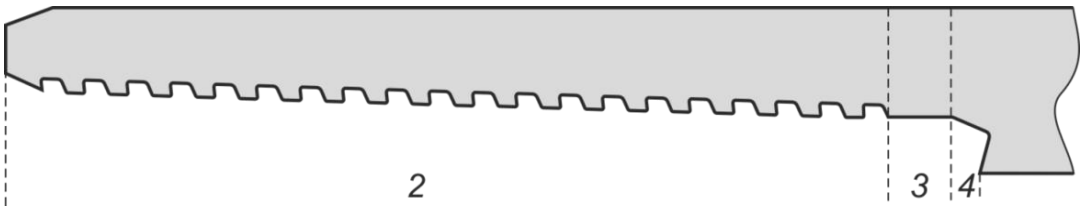
6.4.8 If damages of pipes and couplings thread connections surface of thread, seals and shoulders are detected during make-up, repair shall be done according to the requirements of Table 10 and Figure 17, or pipes and couplings shall be rejected;

Table 10 - Types of possible damages of thread connections surface after make-up - break out and methods of their repair.

Surface area (Figure 16)	Type of damage	Degree of damage As per the time allowed for elimination, not more than	Method of repair
1, 2	Unevenness Of profile (peaks and roots, figure 17)	Light damages Which can be removed within Not more than 10 minutes	Manual repair (removal of peaks up to the level of adjacent surface of thread turn) by polishing with the grain sized 100–150 micron.
		Moderate damages - which can be removed within Not more than 10 minutes	Manual repair (removal of peaks up to the level of adjacent surface of thread turn) by needle file No. 2 and No. 3 and polishing with the grain sized 100–150 micron for further treatment.
		Severe damages - which can not be removed within 10 minutes	Not to be repaired
1, 2, 3	Dents, nicks, Tears, grooves and other defects	Light damages Which can be removed within Not more than 10 minutes	Manual repair (removal) using polishing paper with grain 100÷-150 micron
		Moderate damages - which can be removed within Not more than 10 minutes	Manual repair (removal) using needle file No.2 and No.3, and polishing with grain 100÷150 micron for further treatment
		Severe damages - which can not be removed within 10 minutes	Not to be repaired
4	Grooves	light damages - which can be removed within Not more than 10 minutes	Repair (removal) by buffing
		Moderate and severe damages - which can not be removed within 10 minutes	Not to be repaired
	Dents, nicks, flaws and other defects of any depth	Damages of any degree	Not to be repaired



a) – Surface of external thread connection

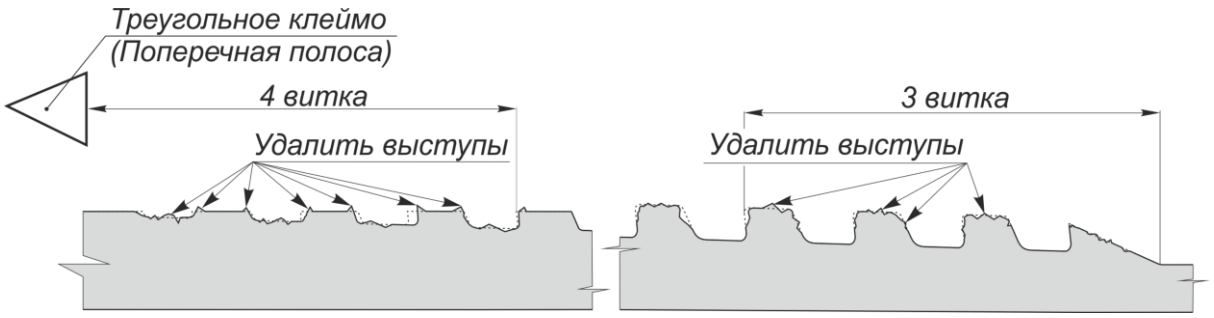


b) – Surface of internal thread connection

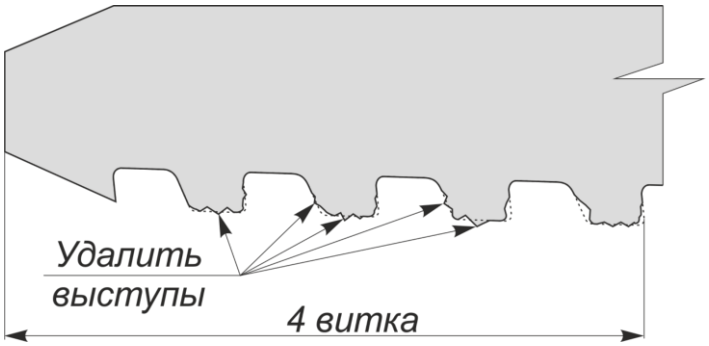
1 - imperfect profile of thread; 2 - perfect profile of thread;

3 – cylinder groove or bore; 4 - seal and thread shoulders.

Figure 16



a) – Surface of external thread connection



b) – Surface of internal thread connection

Figure 17

If any unacceptable damages are detected on pipes, such pipes shall be rejected then and reported accordingly specifying pipes serial numbers, describing defects found with photos attached.

6.4.9 If after repair or break-out surface damages exceed 25% of GW compound surface area on coupling, a uniform layer of RUSMA Polimer Premium P repair composition shall be applied on damaged areas using a brush.

If after repair or break-out surface damages exceed 25% of GW compound surface area on pin, a uniform layer of RUSMA Polimer Premium NDM repair composition shall be applied on damaged areas using a brush.

If less than 25% of GW compound surface area on pin or coupling is damaged, no repair of coating is required. Coating properties are provided by the rest of coating area.

If there is no repair composition, further use of pipes shall be performed only with recommended thread compound according to Annex B.

6.4.10 GW compound delamination is allowed on pin and coupling surface if it is not more than 25% from coated surface with possibility of further use. An example of appearance of thread connection with GW compound on pin and coupling after string disassembly is provided in Figures 18 and 19.

Figure 18

Figure 19

6.4.11 If compound delamination exceeds allowed value (para. 6.4.10) repair composition shall be applied.

6.4.12 After repair or the string disassembly, thread protectors shall be immediately installed on pin and coupling ends.

6.4.13 If storage of pipes is needed, the following shall be done:

- Visual inspection of thread protectors for damages;
- Visual inspection of pipes and couplings for significant mechanical damages;
- Visual inspection of thread, thread seals and thread shoulders surfaces of pins and couplings;
- – Application of storage compound Kendex OCTG, BESTOLIFE Storage Compound (BSC), Total Jet Marine, RUSMA storage compound, RUSMA - M3 or thread compound with storage properties on thread connections of pins and couplings and installation of thread protectors according to para. 5.7.

7. Developer’s warranty

Provided that the present recommendations are met, TMK UP PF thread connection shall withstand at least 3 make-up and break-out cycles preserving the same technical characteristics.

Annex A

(mandatory)

Equipment for make-up registration

TMK UP PF thread connection shall be made-up using equipment for make-up registration and saving of make-up diagram (make-up curve) in a graphical or electronic format.

The make-up curve is plotted by torque values (vertical axis) and the number of revolutions (horizontal axis), which shall be linear scaled. Only last two revolutions are recommended to be recorded on the diagram, since torque increases at make-up completion.

When using a computer, a make-up diagram shall have the following characteristics:

– Sufficient resolution (at least 800×600 pixels) for accurate display of the curve profile. The display screen shall be with the diagonal size of at least 9.8425 inch, and the make-up curve shall occupy at least 80 % of the screen area;

– Display of minimum and maximum torque with horizontal lines (if required, optimum torque shall be displayed);

- display of minimum and maximum shoulder torque as horizontal lines;

– Automatic and manual determination of shoulder torque of thread connection;

– Display of rig floor number of each make-up;

– Date and time display for each make-up;

- possibility to add comments;

– Display of company-customer name, well number, pipe outside diameter and wall thickness, weight, steel grade, type of thread connection, thread compound data and pipe manufacturer;

– superimposing of the latest make-up curve over the curves of previous satisfactory make-up diagrams;

– display of make-up speed in rpm, either on the make-up curve or on a separate graph.

Acceptance or rejection of make-up operations shall not be based on displayed make-up results. Correctness of make-up shall be confirmed by a competent specialist.

Prior to running the casing downhole
the calibration certificate with the latest and next planned equipment
calibration dates shall be checked!

Annex B
(recommended)
Thread compound application

B.1 To ensure optimum conditions for make-up and to avoid burrs of mating surfaces, all surfaces of thread, thread seals and thread shoulders of pins and couplings shall be provided with thread compound.

The following types of thread compound are recommended:

- RUSMA-1 and its modifications;
- RUSMA R-4 and its modifications;
- RUSMA API Modified 1000;
- RUSMA API Modified;
- Bestolife API Modified;
- Bestolife 72733;
- Bestolife 2000;
- Bestolife API Modified HP/HT;
- Bestolife 2000 NM;
- JET-LUBE API Modified.

During make-up of pipes from chromium and chrome-nickel steels with the chrome content over 3 %, it is recommended to use RUSMA R-4 and RUSMA R-14 thread compounds and their modifications.

By agreement with the developer of the connection, other thread compounds that meet requirements of GOST R ISO 13678 and API RP 5A3/ISO 13678 are allowed.

B.2 Thread compound for make-up shall only be taken from original packages, delivered by the supplier, the container shall show name, batch number and manufacturing date.

Compound from packages without proper identification shall never be used. Compound shall never be placed in other packages or dissolved!

Compound applied shall be homogeneous, of ointment consistency, free from any solid inclusions (stones, sand, dry compound, fine chips, etc.).

Prior to use, check compound’s expiration date on the package. Never apply compound with expired shelf life.

Make sure you follow the recommendations specified below when using thread compound:

– Use the same compound (the same type) when assembling one casing string;

– Use a new compound package for each running, if the compound from opened package is used, make sure it is free from foreign inclusions;

– Stir the compound thoroughly before use;

– Warm up compound before application in case of freezing temperatures.

Compound shall be stored in closed overturned packages at the temperature specified by the manufacturer. When storing partially unused compound, always specify the date of the first use on the package.

B.3 Thread compound shall be applied in an even and continuous layer on the whole thread surface, thread seals and thread shoulders of pins and couplings connections. Figures B.1 and B.2 demonstrate proper and improper application of compound.

Compound shall be applied only on thoroughly cleaned and dried surfaces of thread connection.

Never use metal brushes for compound application!

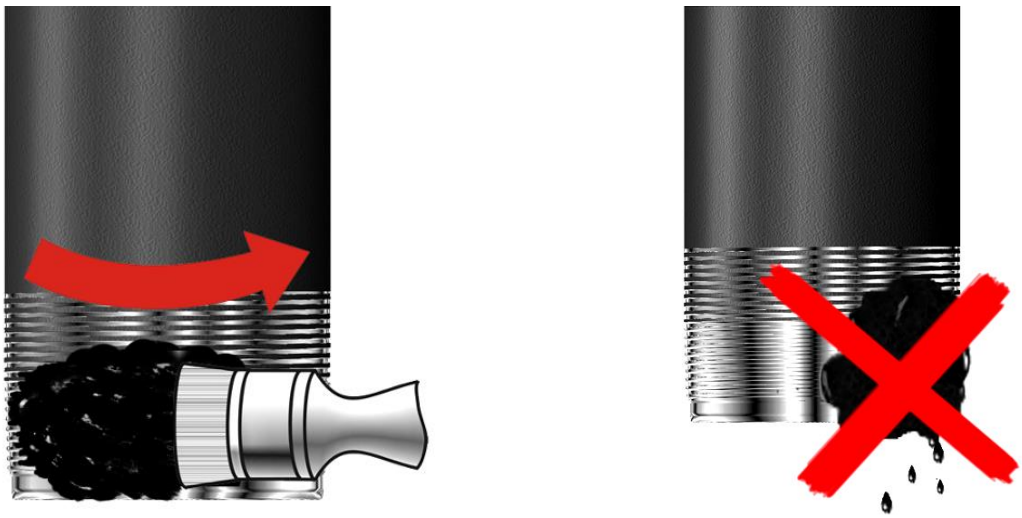


Figure B.1

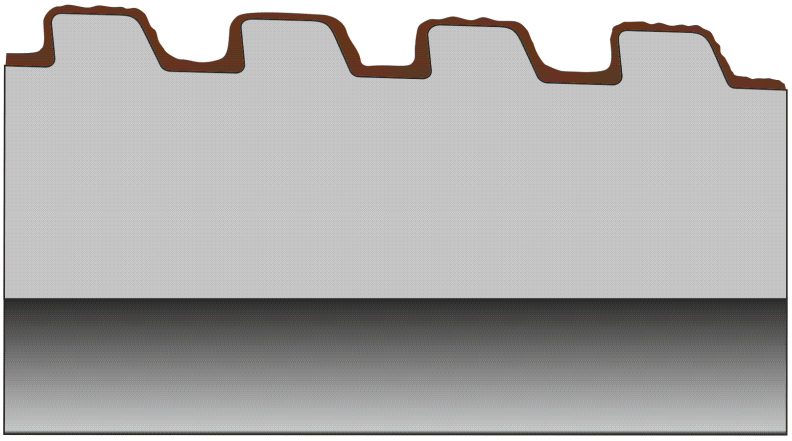


Figure B.2

B.4 Required amount of thread compound shall be distributed between coupling and pin ends as follows: two thirds shall be on the coupling end and one third shall be on the pin end.

Minimum and maximum compound mass m_{min} and m_{max} in gr for make-up of one thread connection shall be calculated as follows:

$$m_{min} = 0.25 \times D \quad (2)$$

$$m_{max} = 0.30 \times D \quad (3)$$

where:

m_{min} is the minimum compound mass in gr rounded to an integral value;

m_{max} is the maximum compound mass in gr rounded to an integral value;

D is an outside diameter of pipes, in mm, rounded to an integral value.

Example. The minimum quantity of thread compound required for make-up of one thread connection of a coupling and pipe with an outside diameter of 244.48 mm (9 5/8 inch):

min = 0.25 x 244.5 ≈ 61 gr (2.15oz) with at least 43 gr (1.52oz) per coupling and at least 18 gr (0.63oz) per pin.

N o t e – calculated weight of compound is theoretical.

B.5 To determine the quantity of compound required for determined number of pipes, a package of compound with specified volume shall be used.

Prior to pipes running down the hole, make sure that required thread compound of one type is available.

B.6 Thread sealant can be used for make-up of pipes with crossovers or other string elements provided the below conditions are followed:

- Shoulder torque of thread shoulders are from 25% of optimum make-up torque and final make-up torque exceed shoulder torque by 20%;

– if shoulder torque of thread shoulders is higher than 80% of optimum make-up torque and it does not result from thread jamming or damage, and 20% of optimum make-up torque is applied after the shoulders interlock.

Attachment B
(mandatory)
Requirements to safety upon casings operation

C.1 Safety Ensuring

Measures to ensure safety during casings operation, including their putting into operation, technical maintenance, all types of repair, periodical diagnostics, tests, preservation are determined by the company that uses the equipment, consisting of casings.

C.2 Specified service life rate

The specified service life of casings shall be at least 365 days and nights since the moment of their putting into operation subject to compliance with the requirements of the present guidelines for use.

When the service life of casings is expired, the decision on their inspection and determination of new service life is made by the company that uses the equipment consisting of casings.

C.3 list of critical failures

Critical failures during casings operation are loss of tightness and thread connection or pipe integrity as a whole.

Critical failures may result from actions of the personnel connected with maintenance of the equipment, consisting of casings, and related to the non-compliance with the requirements of the present guidelines for use,

C.4 Actions of personnel in case of failure or accident

In case of critical failure or accident the personnel connected with maintenance of the equipment, consisting of casings, shall perform the following actions:

- inform the executives about failure or accident immediately;
- take measures to eliminate failure or accident and inform the executives about it.
- after elimination of failure or accident it is required to report briefly and exactly on the incident in the operator shift log, specifying the place, reason of failure or accident, measures taken to eliminate them.

Works on elimination of failure or accident shall be performed according to the plan worked out by the company than uses the equipment, consisting of casings.

C.5 Criteria of limit states

C.5.1 Wall thickness loss and internal surface state

The key factors which determine the limit state of casings are considered to be wall thickness loss and internal surface state.

Decrease in pipe wall thickness is stipulated by metal loss usually on pipe internal surface as a result of mechanical wear or galling, caused by mechanical effect of the equipment and pipes, located inside the casing string. Decrease of pipe wall thickness loss may result in uniform pipe wall wear or local mechanical damages.

Deterioration of pipe internal surface state is stipulated by corrosion environmental exposure, under conditions of which recovery is performed.

Maximum allowable pipe wall thickness loss (prior to decommissioning) - is 50% of the nominal wall thickness.

C.5.2 Evaluation of validity

Evaluation of casings validity for further operation requires inspection of the wall thickness loss and pipes internal surface state to determine resistance to crumple, burst, tensile and corrosion effect, and shall be performed in compliance with the regulatory documentation on pipes.

C.6 Decommissioning and utilization

Decommissioning of pipes shall be performed by the company that uses the equipment, consisting of casings, if the casings limit state criteria, specified in para 5.5, C.2 and C.5 of the present guidelines for use, are achieved. Decision on utilization of the casings shall be made up depending on the terms and conditions of well abandon.

C.7 Employee qualification

Employee involved in maintenance of the equipment, which includes the casings, shall have professional training of not lower than advanced education.

Prior to putting pipes into operation the employee shall be acquainted with the casings specifications and with the present guidelines for use.